REMARKS

Claims 1-66 are now pending, of which Claims 1, 13, 25, 26, 38, and 49 are independent. All claims have been rejected under 35 U.S.C. §§ 102(b) and/or 103(a). For the reasons discussed below, all claims are in condition for allowance.

Claim Amendments

Claims 1, 3, 7, 11, 13, 15, 22-26, 28, 36, 38, 40 and 48-54 are amended by the present amendment to claim the invention more distinctly. In particular, independent Claims 1, 13, 25, 26, 38, and 49 as amended require specifically that the pressure gauge be a total pressure gauge that is in direct fluid communication with an inner vacuum region distinct from an outer vacuum region outside of the condensing surface, and during processing or recovery from processing cycles, the pressure of the inner vacuum region is measured. Support for this amendment can be found throughout the application, at least at paragraphs 5-7, 34, 35-38, and FIGS. 6A-B. Claims 1, 3, 7, 11, 13, 15, 22-26, 28, 36, 38, 40 and 48-54 are further amended to ensure consistency throughout the claims. Acceptance is respectfully requested.

New Claims 55-66 are added by the present amendment. Support for new claims 55, 58, 61, and 64 can be found throughout the application, at least at paragraphs 5, 7, 34, and 35-38. Support for new claims 56, 59, 62, and 65 can be found throughout the application, at least at paragraph 38. Support for new claims 57, 60, 63, and 66 can be found throughout the application, at least at paragraph 7, 31, and 38. Acceptance is respectfully requested.

Claim Rejections

Claims 13, 15-17, 19, 38, 40-42, 44, 51, and 53 have been rejected under § 102(b) based on U.S. Patent No. 5,400,604 to Häfner et al. Claims 18, 21, and 43 have been rejected under 35 U.S.C. § 103(a) based on Häfner. Claims 1, 3-6, 8-12, 24-26, 28-31, 33-37, 47, 49, 50, 52 and 54 have been rejected under 35 U.S.C. § 103(a) based on Häfner in view of U.S. Patent No. 5,014,517 to Larin et al. These rejections are respectfully traversed.

For explanation, but without limitation to the claims, certain embodiments will be described. The fullness of a cryopump is measured by determining when the adsorption capacity of the cryopump is reached. This is achieved by mounting an ion gauge or other total pressure

gauge sensor in the pump vessel with restricted access to an inner pump volume, which contains the adsorbent for adsorbing non-condensable gases. The gauge sensor may be connected to a tube or duct leading to the central core of the pump where the adsorbing charcoal is located. Because of its location in the pump, the sensor remains exposed to non-condensable gases; however, it is shielded from other gases such as nitrogen, argon, oxygen, or water vapor. In particular, the surfaces holding the charcoal are shielded from these other gases by the highly efficient condensation process. As a result, the pressure measured at this location of the pump reflects the pressure of only the non-condensable gases in the pump, such as helium, hydrogen and neon.

By using a pressure gauge, which is nominally sensitive to all gases, to sense pressure in an inner region of the cryopump where only the non-condensable gases are substantially present, the hydrogen adsorption capacity of the adsorbent in the inner vacuum region can be measured during processing cycles and recovery cycles. A rise in pressure during recovery to a predetermined level can signify that the pump has reached its adsorption capacity. See FIGS. 6A-6B. If, for example, the pressure gauge indicates that there is a rise in pressure to about 5×10^{-6} torr during recovery, then the pump has reached its adsorption capacity.

By way of contrast, Häfner teaches to use pressure sensors to monitor the total pressure in the pump chamber during regeneration. Typically, a cryopump needs to be regenerated after several days or weeks of use because gases that are adsorbed, accumulate and begin to saturate the cryopump. This decreases the pumping capacity and speed of the pump. A regeneration procedure warms the cryopump and releases and remove the gases from the system. Häfner teaches to detect the pump's pressure during regeneration using a pressure sensor (36) to detect pressure in the insulated vacuum region (25), and using a pressure sensor (37) to detect pressure in the pump interior (9). These pressure sensors discussed by Häfner detect the <u>total pressure</u> in the insulated vacuum region and in the pump interior. In particular, sensor (37) would detect the higher, outer pressure of the pump because there is no duct or other mechanism to isolate the sensor to the inner low pressure region.

Thus, Häfner does not discuss coupling a total pressure gauge in <u>direct</u> fluid communication with an inner vacuum region behind a condensing surface distinct from an outer vacuum outside the condensing surface as set forth in Claim 1. Häfner discusses detecting the

total pressure of pump (including the inner and outer vacuum regions). Häfner does not disclose the inventive approach for monitoring pressure of the inner vacuum region behind the condensing surface, distinct from an outer vacuum outside the condensing surface, as required by Claim 1.

Moreover, Häfner does not discuss or allow for measuring pressure behind a condensing surface of a cryopump during processing or recovery as claimed. Häfner focuses on monitoring the pump total pressure during regeneration and, thus, teaches away from measuring the pressure of the inner vacuum region during processing or recovery from processing cycles, as set forth in Claim 1.

Furthermore, Claim 1 specifies that the adsorption capacity of the adsorbent is determined using the measured pressure. The Examiner correctly notes that Häfner does not disclose using the measured pressure to determine an adsorption capacity of the adsorbent, and Larin is cited to show this feature.

Larin, however, discusses that the sorbent adsorbs gases in the cryopump coming from the working chamber. Larin further states that when the sorbent temperature is about 50K, the sorption capacity of the sorbent is increased several orders of magnitude compared to that at 77.4K, or else the equilibrium pressure is decreased by 3 to 4 orders of magnitude after adsorption of the same quantity of gas. Thus, Larin appears to teach that at lower temperatures/pressures, a cryopump is able to adsorb more gases, and this concept is one of the basic principles of cryopump operation. This is one of the basic principles of cryopumps but it suggests nothing toward how to measure the remaining capacity of the adsorbent after gas has been adsorbed at the low temperature.

As such, Larin does not relate to the claimed approach for determining adsorption capacity as set forth in Claim 1.

Thus, neither Häfner nor Larin are directed to the inventive technique of using a standard pressure gauge to sense pressure in a specific low pressure region of the pump as in Claim 1. By measuring pressure at this location in the pump during processing and recovery, the invention of Claim 1 is able to use this information as an indicator of hydrogen fullness. Conversely, neither Häfner nor Larin even consider how to measure pressure in a cryopump to obtain an isolated reading for a particular gas, such as hydrogen. Furthermore, neither of the cited references relate

to determining an adsorption capacity of the pump, and thus, neither of the cited references discuss the solutions provided by Claim 1.

As such, Häfner and Larin, taken alone or in combination, do not suggest or disclose the invention of Claim 1. Independent Claims 13, 25, 26, 38, and 49 included similar limitations to those set forth in Claim 1, and for reasons similar to those set forth in Claim 1, independent Claims 13, 25, 26, 38, and 49 and their respective dependent claims are not suggested or disclosed by either Häfner or Larin, taken alone or in combination.

Therefore, it is respectfully requested that the §§ 102(b) and 103(a) rejections based on Häfner and/or Larin be reconsidered and withdrawn.

New Claims

New Claims 55, 58, 61, and 64 specify determining that the adsorption capacity has been reached if a rise in pressure during recovery is detected. Neither Häfner nor Larin, taken alone or in combination, discuss this inventive concept. Thus, it is believed that new Claims 55, 58, 61, and 64 are in condition for allowance. Acceptance is respectfully requested.

New Claims 56, 59, 62, and 65 specify that the rise in pressure during recovery is detected when there is a rise in pressure behind the second stage array to about 5×10^{-6} torr. Neither Häfner nor Larin, taken alone or in combination, discuss this inventive concept. Thus, it is believed that new Claims 56, 59, 62, and 65 are in condition for allowance. Acceptance is respectfully requested.

New Claims 57, 60, 63, and 66 specify that a residual pumping capacity is determined and communicated to the host control system. Neither Häfner nor Larin, taken alone or in combination, discuss this inventive concept. Thus, it is believed that new Claims 57, 60, 63, and 66 are in condition for allowance. Acceptance is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,

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